PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in or relating to Apparatus for and Method of Filling a Receptacle with Plastic Edible Material, for example Semi-frozen Ice Cream

We, CHERRY-BURRELL CORPORATION, a corporation organized under the laws of the State of Delaware, United States of America, of 427, West Randolph Street, Chicago, State of Illinois, United States of America, (Assignees of CHARLES FREDERICK WEINREICH), do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

The present invention relates to a method of and apparatus for filling receptacles in succession with an aerated partially frozen ice cream or other analogous products continuously delivered from a pressure freezer and sufficiently stiff so that it does not promptly seek its own level in the receptacle.

In accordance with the present invention, the method of filling a receptacle with plastic edible material, for example semi-frozen ice cream, having air incorporated therein, includes the step of delivering the plastic material under pressure in a confined stream into a receptacle while expanding the plastic material gradually and progressively into the cross-section or approximately the cross-section of the receptacle.

The present invention also contemplates a method of filling a receptacle with plastic partially frozen ice cream having air incorporated therein, which includes the step of delivering the ice cream under pressure in a confined stream into a receptacle while gradually permitting expansion of the air cells in the ice cream, gradually decreasing the rate of flow thereof, and gradually decreasing the friction on the confining wall whereby air is retained with the minimum of rupturing or coalescing of the air cells.

It is also within the purview of the present invention to provide a device for filling a receptacle with plastic edible material, for example semi-frozen ice cream, including a delivery conduit for the material, and a discharge nozzle widening toward its outlet end so as to reduce the pressure of the material flowing through the nozzle and gradually expand the air in the material to avoid rupturing of the air cells.

An apparatus for filling receptacles with ice cream delivered under pressure in plastic semi-frozen condition from a continuous freezer through a conduit and directly into a receptacle for hardening, storage and transportation has been proposed heretofore in which the lower end of the conduit projects into the open top of the receptacle during the filling operations and said conduit and said receptacle are relatively moved apart in a substantial vertical direction during said operations. In this prior construction, the conduit has an outlet end substantially smaller than the cross-section of the receptacle and there is provided a spreader member of substantially the shape and cross-sectional area of the receptacle so as to level off the ice cream towards the sides of the receptacle and prevent the incorporation of air pockets.

Ice cream mix after being subjected to a freezing, whipping, and aerating action in a continuous freezer, will be in a plastic semi-frozen condition with the fat, entrapped air, and ice crystals uniformly dispersed through the mass.

There is a tendency toward rupture of the moisture film surrounding the fat globules, ice crystals and entrapped air, caused by the substantial friction between the conduit walls and the ice cream flowing through the conduit. This friction is increased if the flow at the outlet end of the conduit is restricted. Rupture of the moisture films is also caused by rapid expansion at the end of the delivery conduit.

In the prior device above referred to the spreading or leveling off operation referred to forces a thin layer of ice cream from the center towards the side of the receptacle, this layer being too thin to permit the larger particles of solid material such as fruit, nuts or candies to pass therewith towards the sides of the receptacle, so that these particles tend to remain in the central

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portion of the receptacle.

Among the objects of the present invention are to provide a method and apparatus which will insure maintenance of proper distribution of ice crystals, fat globules and entrapped air in our ice cream mix, which was established in the freezer; to establish a controllable and regulated relation between the reduction of friction and the reduction of pressure, as the ice cream passes from the conduit into the container; and to make possible the preservation of the moisture film in the ice cream, which insures the proper dispersion of the various ingredients comprising the ice cream mix.

A further object is to provide a filling device in which the uniform distribution of solid particles therein, such as fruit, nuts or candy, is insured in the ice cream after it is packed in the receptacle.

In carrying out the present invention, there is provided a delivery conduit having a discharge nozzle widening towards its outlet end and presenting a maximum cross-section at said end, so that the pressure of the ice cream decreases as it flows toward said outlet end and the friction between said flowing ice cream and the walls of said discharge nozzle is gradually reduced to an extent necessary to preserve the moisture films which insure proper dispersion of the various ingredients of the ice cream.

As an additional feature, the outlet end of the discharge nozzle conforms substantially with the cross-section of the receptacle, so that the ice cream is expanded in said nozzle to the approximate cross-section of the receptacle, thereby maintaining uniform distribution of the solid particles in the receptacle.

Various other objects, features and advantages of the invention will be apparent from the following description and from an inspection of the accompanying drawings in which:

Fig. 1 is a plan view, somewhat diagrammatic, showing the combination of a primary continuous freezer, a device for injecting solids into the stream of stiff partially frozen ice cream, and one form of receptacle filling device embodying the present invention.

Fig. 2 is a bottom plan view of the lower end of the discharge nozzle of the construction of Fig. 1 and showing a form of grating for supporting the ice cream in the nozzle against tensile breakage while exchanging an empty container for a filled one.

Fig. 3 is a vertical section through another form of discharge nozzle embodying the present invention.

Fig. 4 is a bottom plan view of the lower end of the discharge nozzle shown in Fig. 3, and

Fig. 5 is a vertical section through a part of a container and another form of discharge nozzle embodying the present invention.

The type of apparatus illustrated is especially adapted for filling an ordinary ice cream can or receptacle 10 such as is commonly used for the storage, hardening and shipment of ice cream. The filling apparatus is connected to a conduit 11 which is shown as leading from a continuous pressure freezer 12.

A known type of continuous freezer may be used in connection with the present invention. The pressure freezer is connected to a suitable source of supply of ice cream mix 13, and to a source of air 14, these materials being delivered under pressure to the freezer and in predetermined relative proportions. For that purpose there may be employed a metering pump 15 and a pump 16 of greater speed or capacity to suck in the air and the metered mix and force both into and through the freezer. This ice cream mix is subjected in the freezer to agitation and refrigeration while air is being incorporated therein to give it the desired consistency. The ice cream delivered under pressure from the freezer through the conduit 11 is a semi-frozen plastic product containing air, fat and ice crystals uniformly dispersed throughout the mass.

Solid particles such as fruits, nuts and candies may be injected into the ice cream after it leaves the freezer. For that purpose, there is diagrammatically shown in Fig. 1, on the discharge side of the freezer 12, a fruit or nut feeder 17 which may be of a known type.

Depending substantially vertically from the supply pipe 11 is our improved can filling apparatus which in the specific form shown in Figs. 1 and 2 includes a delivery conduit 18 having at its lower end a discharge nozzle 20 adapted to project into the open top of the receptacle 10 during filling operations.

As an important feature of the present invention, the nozzle 20 is so shaped that as the ice cream flows therethrough, it progressively expands, thereby reducing the pressure of said ice cream and correspondingly reducing the friction between the flowing ice cream and the walls of the discharge nozzle to an extent necessary to preserve the moisture films in the ice cream. In the construction shown in Figs. 1 and 2, the discharge nozzle is in the form of a cone or an inverted funnel presenting a maximum cross-sectional area at its outlet end, so that the expansion of the flowing ice cream through this

nozzle is effected gradually and progressively as it approaches the outlet end of the nozzle.

As a further feature of the present invention, the outlet end of the discharge nozzle 20 has a cross-section corresponding substantially to the cross-section of the receptacle 10, so that the ice cream is expanded in the discharge nozzle to the approximate full size of said receptacle. This construction has the advantage of eliminating the necessity for a spreading device, or if a spreading device is used to confine its action to the peripheral portion of the receptacle, so that the uniform distribution of solid particles in the ice cream established in the injecting apparatus 17 is maintained in this receptacle.

The receptacle 10 and the nozzle 20 are relatively movable vertically during filling operations, at a rate dependent upon the rate of accumulation of the material in the receptacle 10. The details of the means for permitting or aiding this relative movement of the receptacle 10 and the discharge nozzle 20 may be of the type shown in Fig. 1. In this construction the receptacle 10 is supported on a platform 21, having a number of supporting guides 22 depending therefrom, and passing through a fixed platform 23, so that said platform 21 is guided for vertical movement. This platform 21 is normally urged into its uppermost position by coil springs 24 which may encircle the guide rods 22.

As the ice cream accumulates in the receptacle 10, said receptacle is moved downward against the action of the springs 24 at a rate depending on said accumulation, until the platform 21 reaches its lowermost position. In this position the top of the receptacle will be slightly below the outlet end of nozzle 20, so that said receptacle can be moved laterally to shear off the flowing stream of ice cream across the top of said receptacle.

In order to prevent the immediate upward movement of the platform 21 the instant the filled receptacle is removed and before it can be replaced by an empty one, there may be provided one or more latches 26, which automatically engage the platform 21 in its lowermost position, and hold it until manually released.

In Fig. 3 is shown another form of construction which may be used for effecting relative movement of the receptacle and the nozzle vertically. In this construction the delivery conduit comprises a stationary section 30 connected to the conduit 11, and a movable section 31, encircling said stationary section 30, and connected to the upper end of the nozzle 20.

The receptacle 10 is stationary during the filling operation, and the discharge nozzle 20 with its associated conduit section 31 is moved upwardly in the receptacle 10 by the accumulation of material in said receptacle. In order to assist in this upward movement of the discharge nozzle 20, or to counterbalance the weight of the parts, there is provided a pair of cables 32 each connected at one end to said nozzle, passing around a pulley 33, and connected at the other end to a counterweight 34. As the material is forced through the nozzle the accumulation of ice cream in the receptacle forces said nozzle upwardly, this movement being aided by the action of the counterweights 34 until the ice cream reaches the upper level of the receptacle 10. The receptacle may then be moved laterally from beneath the nozzle and an empty one slid into place without interrupting the continuous flow of the stream of ice cream from the freezer.

As there is a considerable mass of ice cream in the enlarged end of the nozzle, it may have a tendency to drop from the outlet end of the nozzle while an empty can is being brought into position due to the tension of the unsupported flowing stream of ice cream beyond said outlet end. To resist this tendency there may be provided a grating 36 as shown in Figs. 1 and 2 extending across the bottom end of the discharge nozzle and detachably or permanently secured by soldering or any other suitable means. This grating 36 tends to support the body of ice cream in the enlarged end portion of the nozzle, so that it does not fall out during the removal of a filled receptacle and the replacing of an empty one in position.

In the form shown in Figs. 3 and 4 the nozzle 20 at its discharge end is somewhat smaller than the receptacle and has a radial outwardly extending annular flange 37 extending from the outlet rim of the nozzle substantially to the inner periphery of the receptacle. This flange 37 may form part of the grate 36, or an imperforate wall and may assist in shearing off the ice cream across the top of a filled receptacle, and also as a wiping lip. This flange 37 also serves to spread the ice cream toward the inner periphery of the receptacle, as it is discharged from the nozzle 20. Since the outlet end of the nozzle 20 is substantially co-extensive with the cross-section of the receptacle, and since the flange is comparatively narrow, the spreading action of this flange is not sufficient to affect the uniform distribution of the solid particles in the ice cream.

In the construction shown in Fig. 5, the discharge nozzle comprises a pair of sections 42 and 43 flaring towards the outlet end of the nozzle and intercon-

nected by a cylindrical section 44. The lower end of the flared section 43 is shown as provided with a cylindrical skirt 45 having a cross-section conforming substantially with the cross-section of the receptacle. By means of this construction the ice cream, instead of being continuously and progressively expanded to the discharge point, as in the construction shown in Figs. 1—4, is expanded in separate shorter steps along the sections 42 and 43 so that between said expanding sections the moisture films have a chance to become adjusted to the expanded condition of the ice cream.

By means of our invention the rupturing of the moisture films as the result of the expansion of the air in the ice cream mix is naturally reduced if not entirely eliminated. The ice cream is expanded either continuously or in steps to the approximate cross-section of the receptacle being filled, so that film rupturing friction is minimized, and a uniform distribution of the solid particles is maintained in the ice cream.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is :—

1. A method of filling a receptacle with plastic edible material, for example semi-frozen ice cream, having air incorporated therein, which includes the step of delivering said plastic material under pressure in a confined stream into a receptacle while expanding the plastic material gradually and progressively into the cross-section or approximately the cross-section of said receptacle.

2. A method of filling a receptacle with plastic partially frozen ice cream having air incorporated therein, which includes the step of delivering said ice cream under pressure in a confined stream into a receptacle while gradually permitting expansion of the air cells in the ice cream, gradually decreasing the rate of flow thereof, and gradually decreasing the friction on the confining wall whereby air is retained with the minimum of rupturing or coalescing of the air cells.

3. A device for filling a receptacle with plastic edible material, for example semi-frozen ice cream, including a delivery conduit for the material, and a discharge nozzle widening toward its outlet end so as to reduce the pressure of the material flowing through said nozzle and gradually expand the air in said material to avoid rupturing of the air cells.

4. A device according to claim 3, wherein said nozzle presents at its outlet end a cross-section conforming substantially with but slightly less than the cross-section of said receptacle, said nozzle being adapted to project into the open top of the receptacle during filling operations, and said receptacle and nozzle being relatively movable vertically during receptacle filling operations.

5. A device according to claim 3, wherein the delivery conduit for ice cream under pressure is of such length as to permit it to be projected into the receptacle to the bottom thereof, and the discharge nozzle presents a maximum cross-sectional area at its outlet end substantially larger than that of the conduit and but slightly smaller than the cross-section of the receptacle so that ice cream as it flows through said nozzle expands as its pressure is reduced, said receptacle and nozzle being relatively movable from the bottom of the receptacle to the top in the line of direction of flow of the ice cream from said nozzle during receptacle filling operation.

6. A device for filling a receptacle with plastic edible material, for example semi-frozen ice cream, including a discharge nozzle having the terminal section thereof flaring outwardly for gradually reducing the pressure of the ice cream flowing through said nozzle, said nozzle being adapted to project into the open top of the receptacle.

7. A device for filling a receptacle with plastic edible material, for example semi-frozen ice cream, comprising a pressure freezer for continuously forming and delivering an aerated semi-frozen plastic ice cream, and a conduit extending from said freezer and terminating in a discharge nozzle adapted to be extended into the receptacle, the passage through said nozzle being of progressively larger size towards the lower end whereby the ice cream may gradually expand, its rate of flow gradually decrease, and the friction on the walls of the nozzle decrease during the flow through the nozzle, whereby the receptacle is filled without voids and lateral flow of the ice cream beyond the end of the nozzle is substantially prevented.

8. A device for filling a receptacle with plastic edible material, for example semi-frozen ice cream, including a pressure freezer for continuously forming under pressure and delivering an aerated semi-frozen plastic ice cream, and a discharge nozzle on a conduit connected to said freezer, said nozzle having a passage therethrough of gradually increasing cross-sectional area from the inlet end to the outlet end, and the outlet end being but slightly less in cross-sectional area than the receptacle to be filled, whereby the ice cream stream progressively spreads laterally during flow through the nozzle and has substantially no lateral flow after leaving

the outlet and during relative vertical movement of the nozzle and receptacle during the filling of the latter.

9. A device according to claim 8, wherein said inlet end has approximately the cross-sectional area of the conduit.

10. A device according to any of the preceding claims 3 to 9, having means for injecting solid particles in said semi-frozen plastic ice cream.

11. A device according to claim 3, 7 or 8, and claim 10, wherein said means is adapted to introduce said solid particles in said conduit.

12. A device according to any of the preceding claims 3 to 11, having a grating across the outlet end of the discharge nozzle said grating permitting passage of ice cream and solid particles which may be incorporated in the ice cream, but preventing the ice cream in the nozzle from falling out by gravity during the replacing of filled by empty receptacles.

13. A device for filling a receptacle with plastic edible material, for example semi-frozen ice cream, including means for introducing solid bodies into a conduit adapted to deliver an aerated semi-frozen plastic ice cream, a discharge nozzle on said conduit and having a flaring passage with an outlet slightly less in cross-sectional area than the receptacle for receiving the ice cream, and a grating across said outlet, permitting free passage of said solids therethrough but preventing the body of ice cream in said flaring nozzle from falling out during exchange of an empty for a filled receptacle.

14. A device according to any of the preceding claims 3 to 13, wherein said nozzle is in the shape of an inverted funnel or cone for gradually expanding the ice cream and reducing its pressure as it flows through said nozzle, and said nozzle and receptacle are relatively movable vertically at a rate depending upon the rate of accummulation of said ice cream in said receptacle.

15. A device according to any of the preceding claims 3 to 14, having a flange in the plane of the outlet end of the nozzle and extending outwardly beyond the rim of said nozzle substantially to the inner periphery of said receptacle.

16. A device for filling a receptacle with plastic edible material, for example semi-frozen ice cream, including a delivery conduit having a pair of spaced expansion sections along the length thereof for expanding the material in said conduit by steps as it travels along said conduit, and having its maximum cross-section at its outlet end, said conduit being adapted to project into the open end of the receptacle, and said receptacle and said conduit being relatively movable vertically during receptacle filling operations.

17. A device according to any of the preceding claims 3 to 16, comprising a fruit feeder in the discharge conduit of a continuous pressure ice cream freezer, and a receptacle filling attachment at the end of said discharge conduit, said receptacle filling attachment comprising a flared outlet at the end of said conduit surrounded by a broad flange.

18. A device according to claim 15 or 17, wherein said flange comprises a perforated flat plate joined onto said outlet.

19. A device according to any of the preceding claims 3 to 17, wherein the receptacle is of substantially uniform cross-section throughout its height.

20. A device for filling a receptacle with plastic edible material, for example semi-frozen ice cream, constructed and adapted to operate substantially as herein described with reference to the accompanying drawings.

21. A method of filling a receptacle with plastic edible material, for example semi-frozen ice cream, substantially as herein described with reference to the accompanying drawings.

Dated this 11th day of January, 1938.

For:

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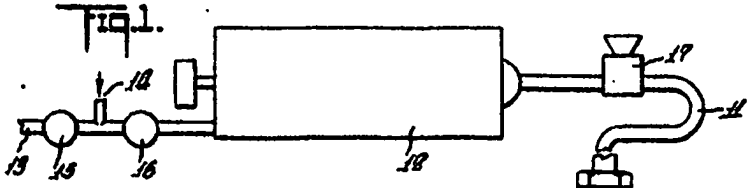
FIG. 1.



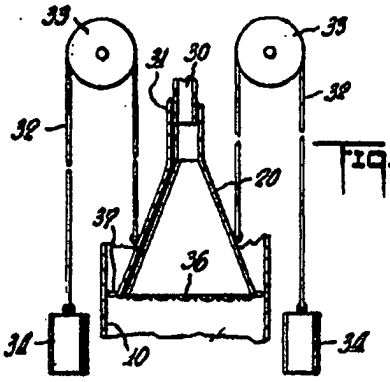


FIG. 3.

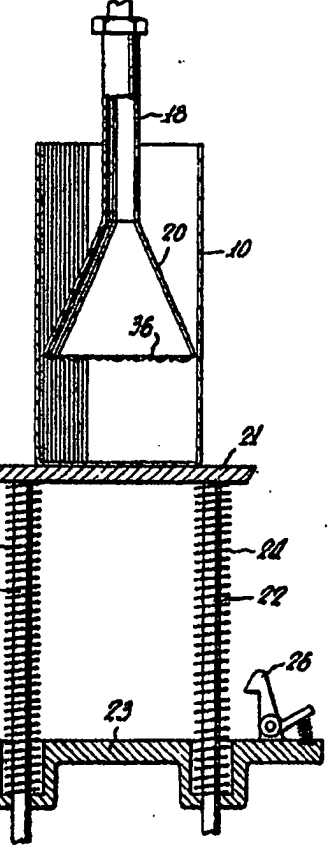


FIG. 5.

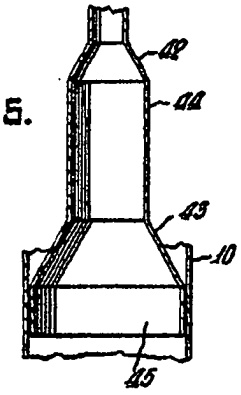


FIG. 2.

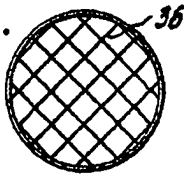
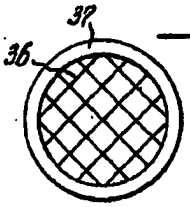


FIG. 4.



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